We claim:

1. A method of producing oligodendrocytes from mammalian multipotent neural stem cells, comprising contacting multipotent neural stem cells with an effective amount of at least one oligodendrocyte promoting factor under conditions that result in production of oligodendrocytes from the multipotent neural stem cells, wherein the oligodendrocyte promoting factor is selected from the group consisting of granulocyte-macrophage colony stimulating factor (GM-CSF), granulocyte colony stimulating factor (G-CSF), interleukin 3 (IL-3) and interleukin 5 (IL-5).

2. The method of claim 1 wherein the oligodendrocyte promoting factor is GM-CSF or G-CSF.

3. The method of claim 1 wherein the oligodendrocyte promoting factor is GM-CSF.

4. The method of claim 1 further comprising contacting the multipotent neural stem cells with triiodothyronine.

5. The method of claim 1 wherein the multipotent neural stem cells are provided as a cell culture.

6. The method of claim 5 wherein the cell culture is prepared using mammalian brain tissue.

7. The method of claim 6 wherein the mammalian brain tissue is obtained from a non-embryonic mammal.

8. The method of claim 6 wherein the mammalian brain tissue is obtained from an adult mammal.

9. The method of claim 6 wherein the brain tissue is obtained from the subventricular zone.

10. The method of claim 1 wherein the multipotent neural stem cells are located in a mammal.

11. The method of claim 10 wherein the multipotent neural stem cells are located in the subventricular zone of the mammal.

12. The method of claim 1 wherein the multipotent neural stem cells are selected from the group consisting of human, dog, cat, rodent, sheep, goat, cattle, horse, pig, and non-human primate cells.

13. The method of claim 1 wherein the multipotent neural stem cells are human cells.

14. The method of claim 1 further comprising contacting the multipotent neural stem cells with an effective amount of at least one biological agent that is capable of increasing the number of multipotent neural stem cells.

15. The method of claim 14 wherein the biological agent is selected from the group consisting of epidermal growth factor (EGF), fibroblast growth factor (FGF), pituitary adenylate cyclase-activating polypeptide (PACAP), transforming growth factor ∀ (TGF∀), ciliary neurotrophic factor (CNTF), estrogen, ovarian hormone, prolactin, growth hormone, and insulin-like growth factor 1.

16. The method of claim 14 wherein the biological agent is EGF51N.

17. The method of claim 14 wherein the multipotent neural stem cells are contacted with the oligodendrocyte promoting factor and the biological agent concurrently.

18. The method of claim 14 wherein the multipotent neural stem cells are contacted with the biological agent prior to the oligodendrocyte promoting factor.

19. A composition comprising the oligodendrocytes produced by the method of claim 4.

20. The composition of claim 19 further comprising a pharmaceutically acceptable excipient and/or a pharmaceutically acceptable carrier.

21. A method of providing oligodendrocytes to a mammal, comprising

(a) introducing multipotent neural stem cells into the mammal and administering an effective amount of at least one oligodendrocyte promoting factor to the mammal under conditions that result in oligodendrocyte formation from the neural stem cells; or

(b) introducing into the mammal an effective amount of the composition of claim 20.

22. The method of claim 21(a) further comprising contacting the neural stem cells with an effective amount of at least one biological agent that is capable of increasing the number of neural stem cells.

23. The method of claim 22 wherein the neural stem cells are contacted with the biological agent prior to being introduced into the mammal.

24. The method of claim 22 wherein the biological agent is selected from the group consisting of epidermal growth factor (EGF), pituitary adenylate cyclase-activating polypeptide (PACAP), fibroblast growth factor (FGF), transforming growth factor ∀ (TGF∀), ciliary neurotrophic factor (CNTF), estrogen, prolactin, growth hormone, and insulin-like growth factor 1.

25. The method of claim 22 wherein the biological agent is EGF51N.

26. The method of claim 21(a) further comprising contacting the multipotent neural stem cells with triiodothyronine.

27. The method of claim 21 wherein the mammal suffers from a demyelinating disease.

28. The method of claim 27 wherein the demyelinating disease is selected from the group consisting of multiple sclerosis, acute disseminated encephalomyelitis, diffuse cerebral sclerosis, necrotizing hemorrhagic encephalitis and leukodystrophies.

29. The method of claim 27 wherein the demyelinating disease is multiple sclerosis.

30. The method of claim 21 wherein the mammal is human.

31. A method of treating or ameliorating a demyelinating disease in a mammal, comprising administering to the mammal an effective amount of at least one oligodendrocyte promoting factor, wherein the oligodendrocyte promoting factor is selected from the group consisting of granulocyte-macrophage colony stimulating factor (GM-CSF), granulocyte colony stimulating factor (G-CSF), interleukin 3 (IL-3) and interleukin 5 (IL-5).

32. The method of claim 31 wherein the oligodendrocyte promoting factor is administered into a ventricle in the brain of the mammal.

33. The method of claim 31 wherein the oligodendrocyte promoting factor is administered into the lateral ventricle of the mammal.

34. The method of claim 31 further comprising administering to the mammal an effective amount of at least one biological agent capable of increasing the number of neural stem cells.

35. The method of claim 34 wherein the biological agent is selected from the group consisting of epidermal growth factor (EGF), pituitary adenylate cyclase-activating polypeptide (PACAP), fibroblast growth factor (FGF), transforming growth factor ∀ (TGF∀), ciliary neurotrophic factor (CNTF), estrogen, ovarian hormone, prolactin, growth hormone, and insulin-like growth factor 1.

36. The method of claim 34 wherein the biological agent is EGF51N.

37. The method of claim 31 further comprising administering triiodothyronine to the mammal.

38. The method of claim 31 wherein the demyelinating disease is selected from the group consisting of multiple sclerosis, acute disseminated encephalomyelitis, diffuse cerebral sclerosis, necrotizing hemorrhagic encephalitis and leukodystrophies.

39. The method of claim 31 wherein the demyelinating disease is multiple sclerosis.

40. The method of claim 31 wherein the mammal is human.